



Borehole Electrical Measurements at Dixie Valley

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Work supported by the California Energy Commission
DOE and EMI, with assistance from Caithness

Presented at the
Dixie Valley Geothermal Workshop
June 13, 2002

GeoBilt is an experimental multi-frequency, multi-spacing EM log for geothermal applications

Tx Dewar

- Power Supply
- Orientation
- Tx Driver
- Tx Capacitor Bank
- Communication

Geo-BILT

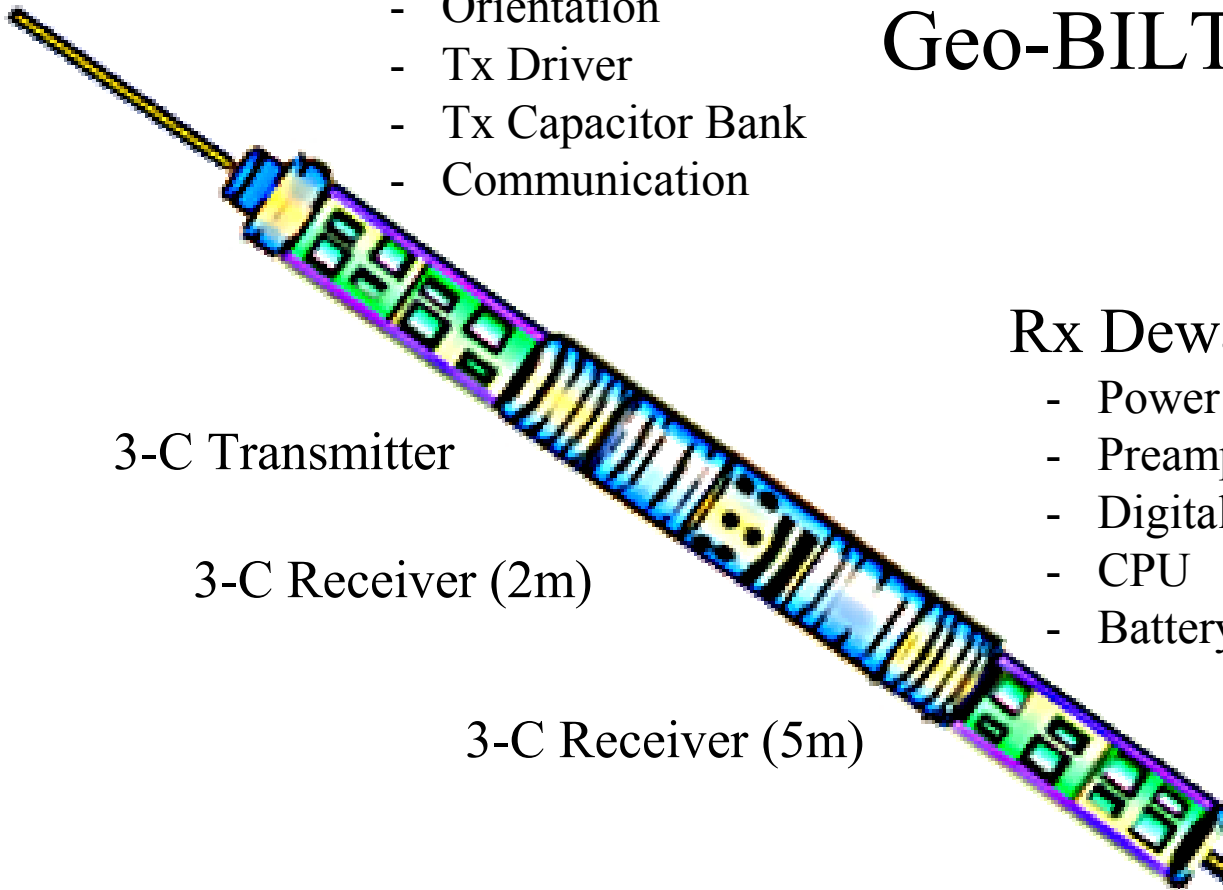
Rx Dewar

- Power Supply
- Preamplifiers
- Digital Acquisition
- CPU
- Battery Pack

3-C Transmitter

3-C Receiver (2m)

3-C Receiver (5m)



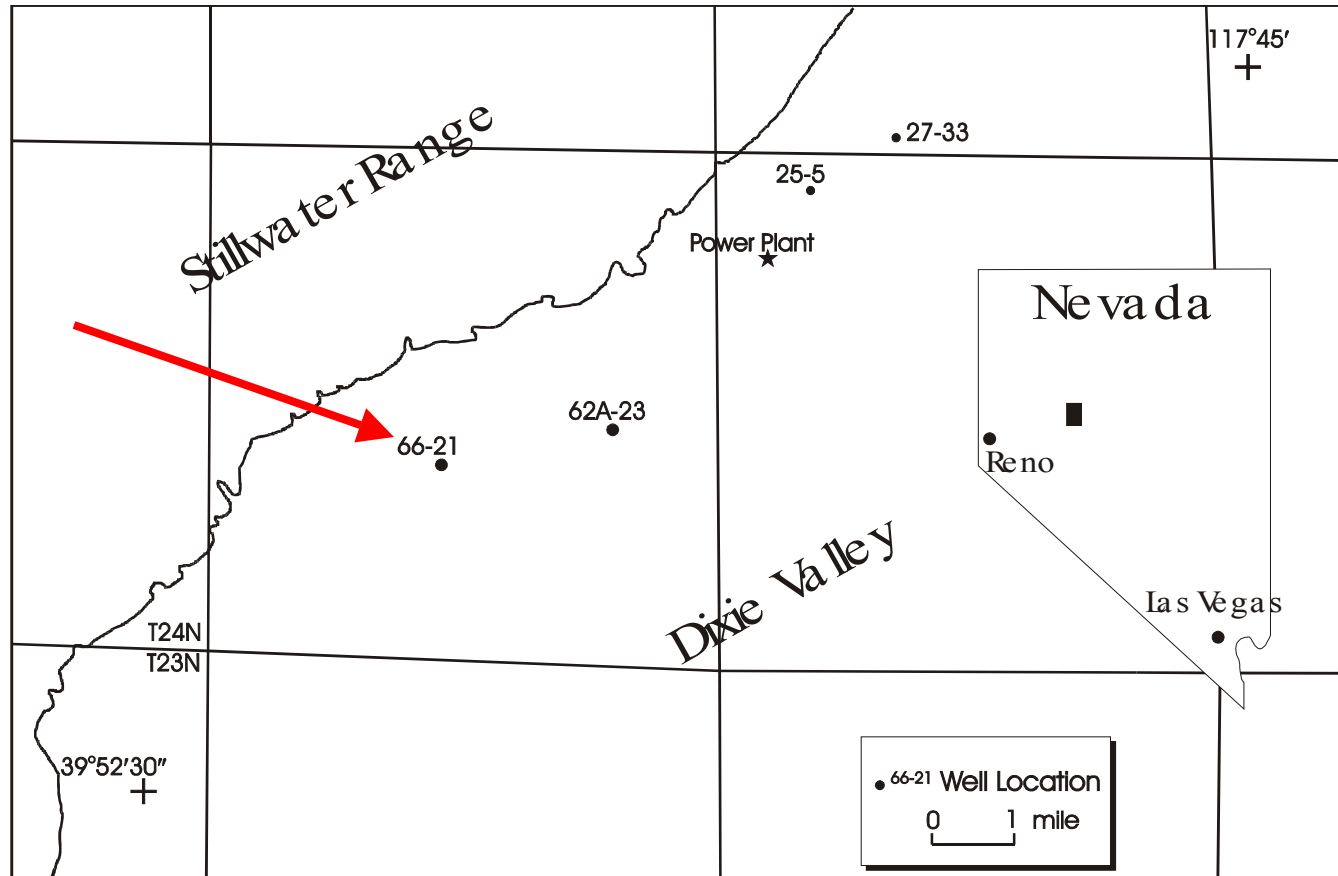
GeoBILT was deployed at Dixie Valley in April, 2002



GeoBilt is an experimental multi-component, multifrequency, high temperature Logging tool for geothermal environments



66-21 is southeast of the producers

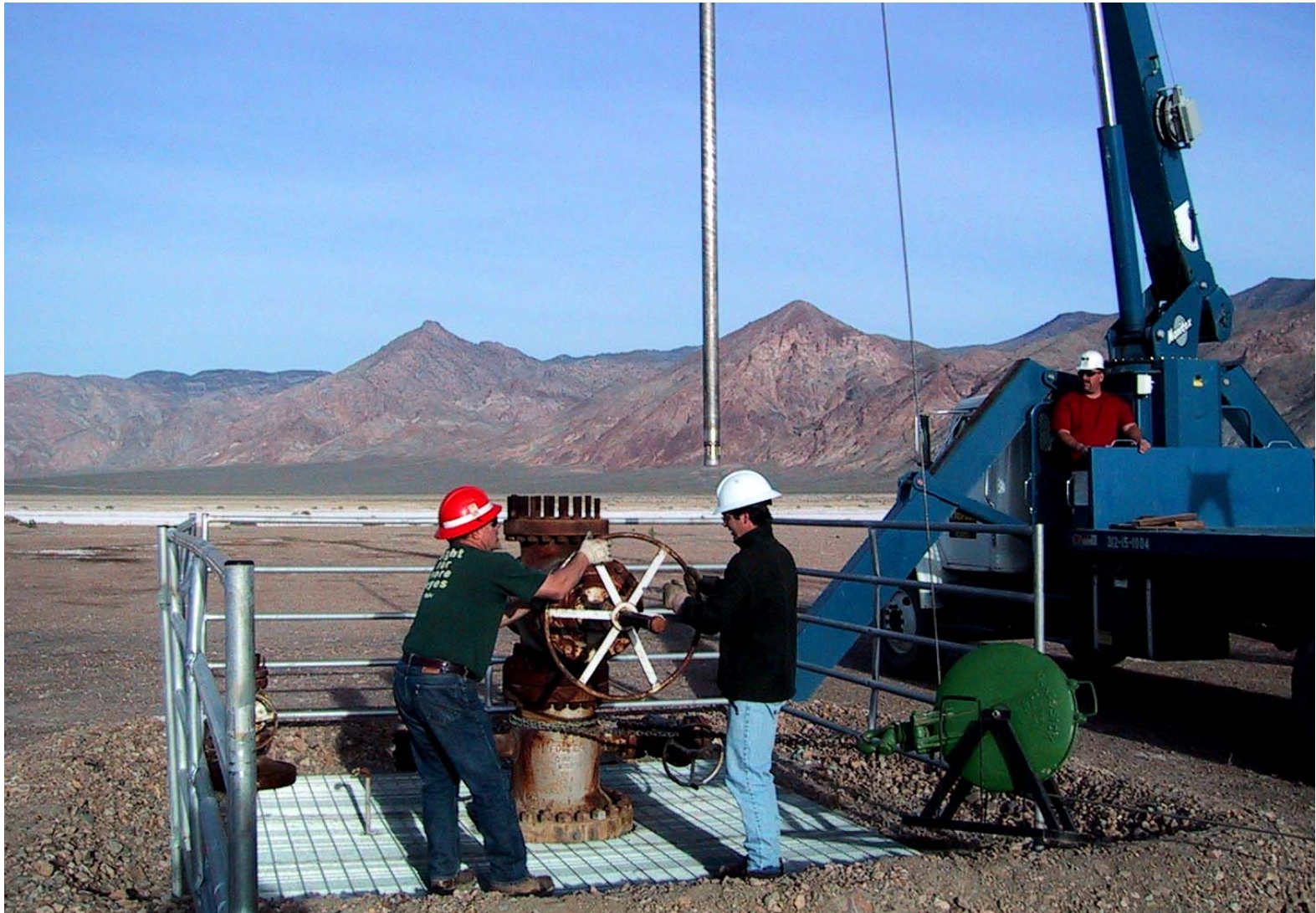




GeoBILT logged 1000 feet of well 66-21



Thermal problems prevented logging in 62A-23

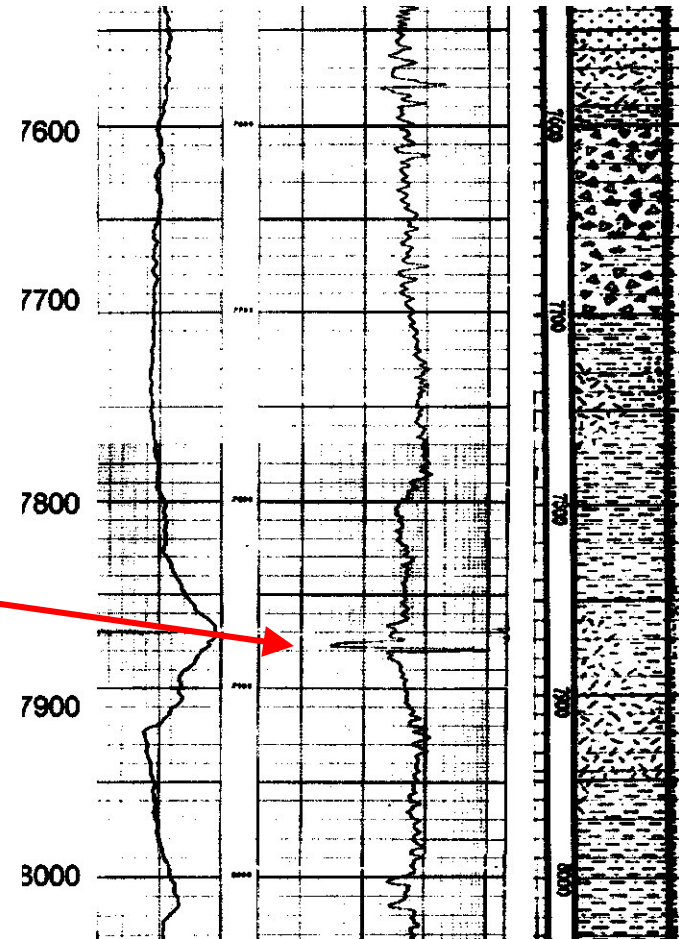


Standard Induction logs in 66-21 are dull

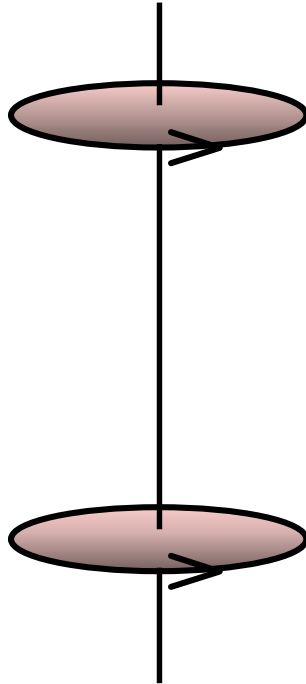


1000 feet of log shows

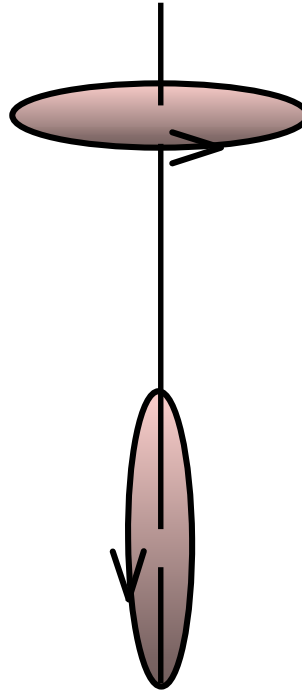
- No correlation with changes in lithology
- No correlation with feed zone
- Only one signal that correlates with fractured areas.



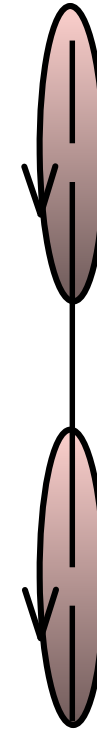
Multiple components provide new information



Coupled



Null: Sensitive
To radial asymmetry

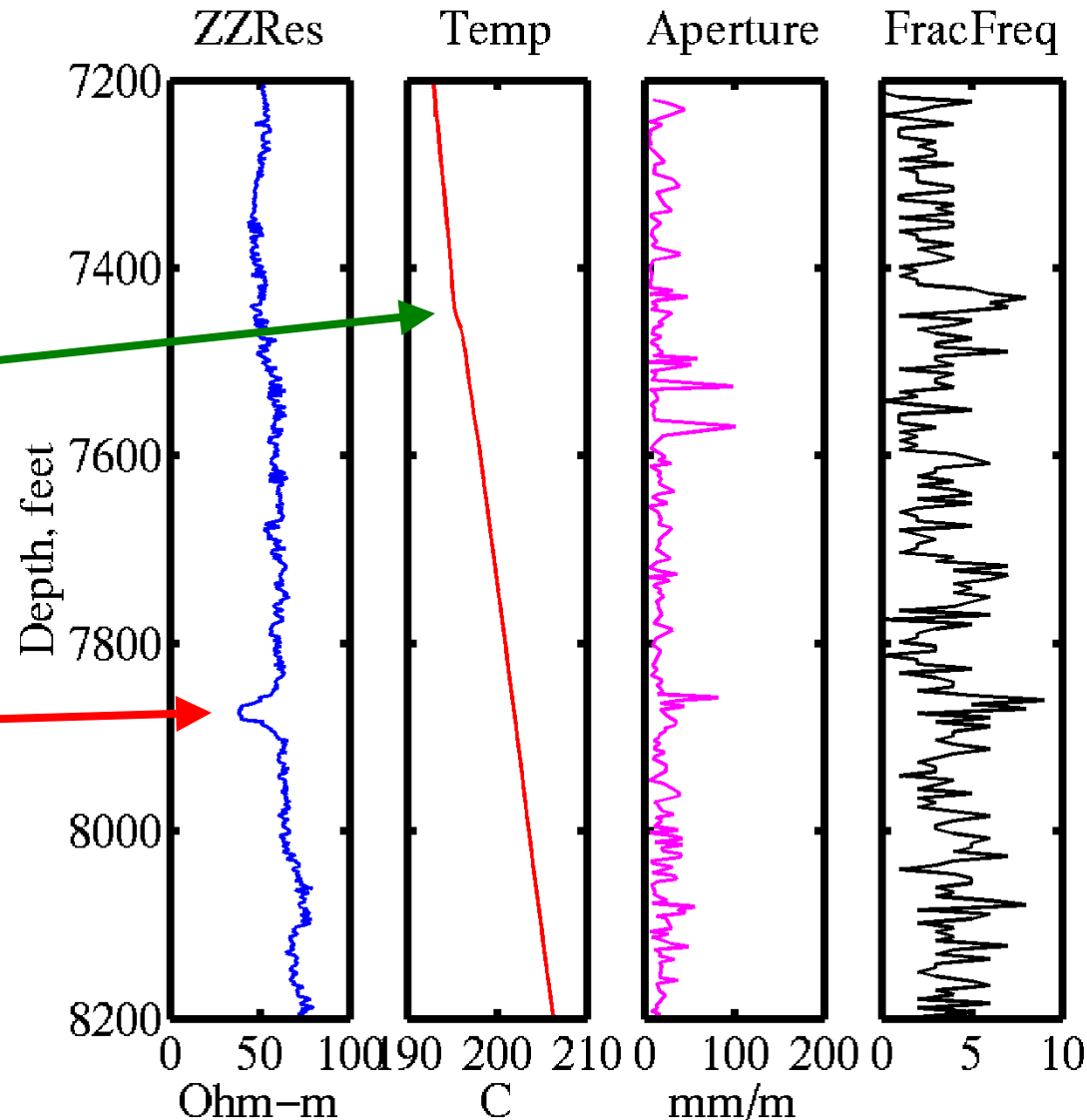


Coplanar

GeoBilt: Coupled signal similar to standard logs



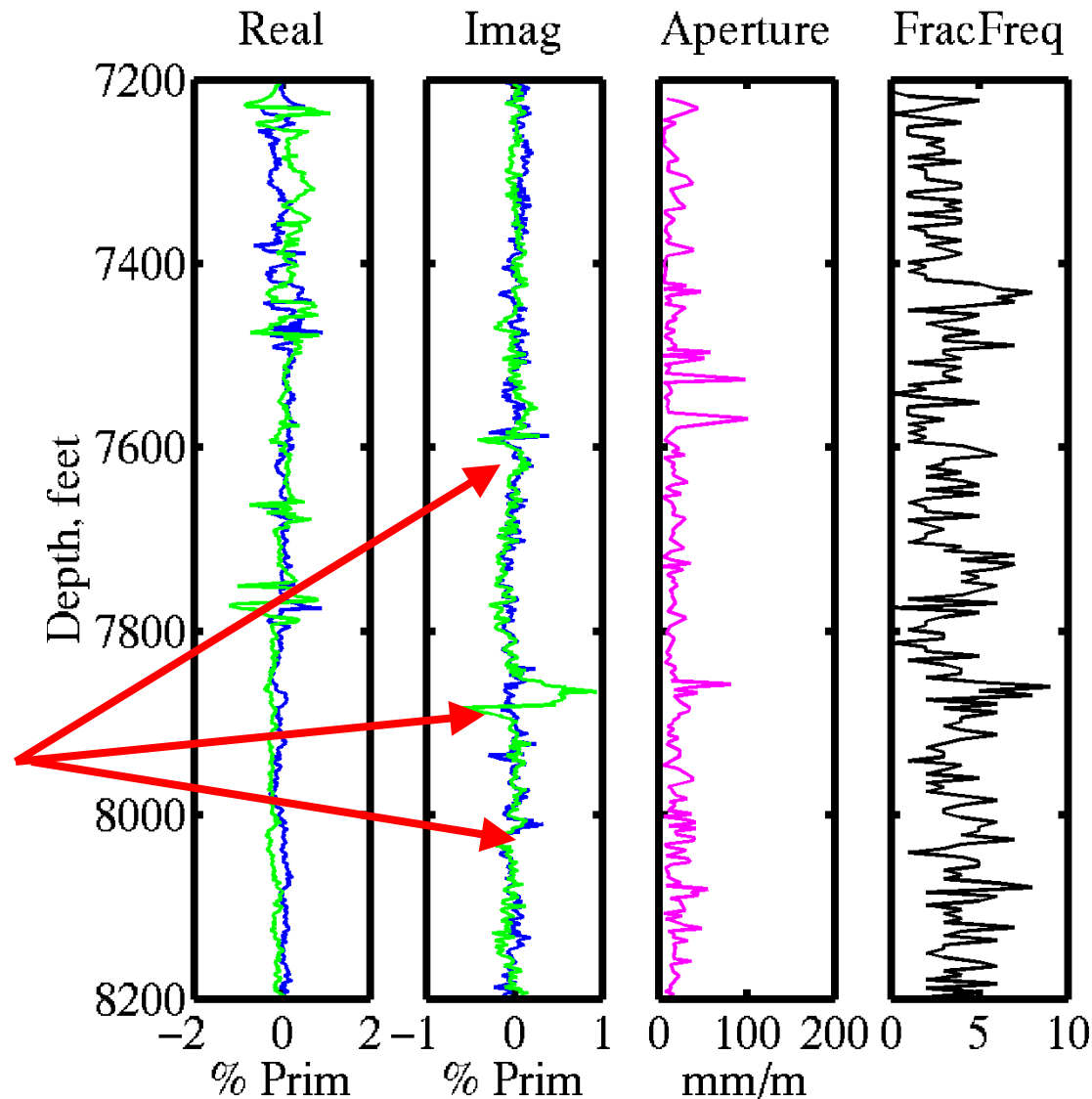
- ZZRes is apparent resistivity from coupled geometry
- Not much character
- Does not identify feed zone
- No correlation with fracture aperture or frequency except at one depth
- Temperature data from Colin Williams; Fracture data from Colleen Barton



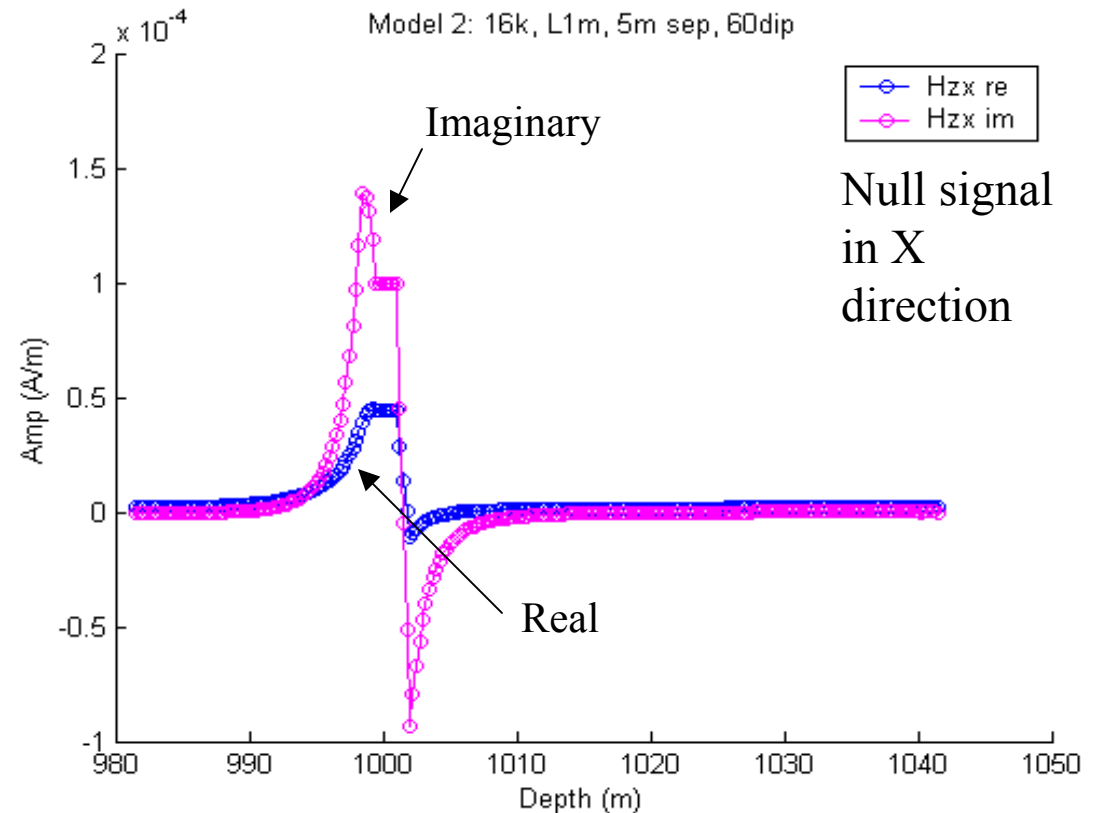
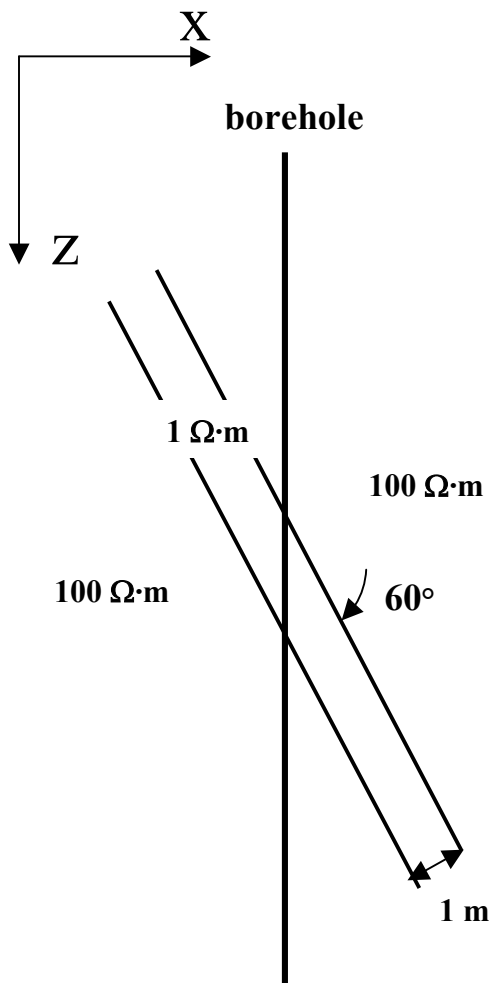
Null signals identify asymmetrical anomalies



- Signal will be zero if geology is flat or radial dependent from the well.
- Non-zero null signals are seen at isolated depths.
- Blue is magnetic north and green is east.
- Imaginary signal identifies three anomalous zones.
- Real signal identifies additional zones.



Anomalies could be dipping conductors



- We modeled a single conductive layer dipping 60 degrees in the X direction.
- The null along strike is zero.
- Null signal points away from conductor.

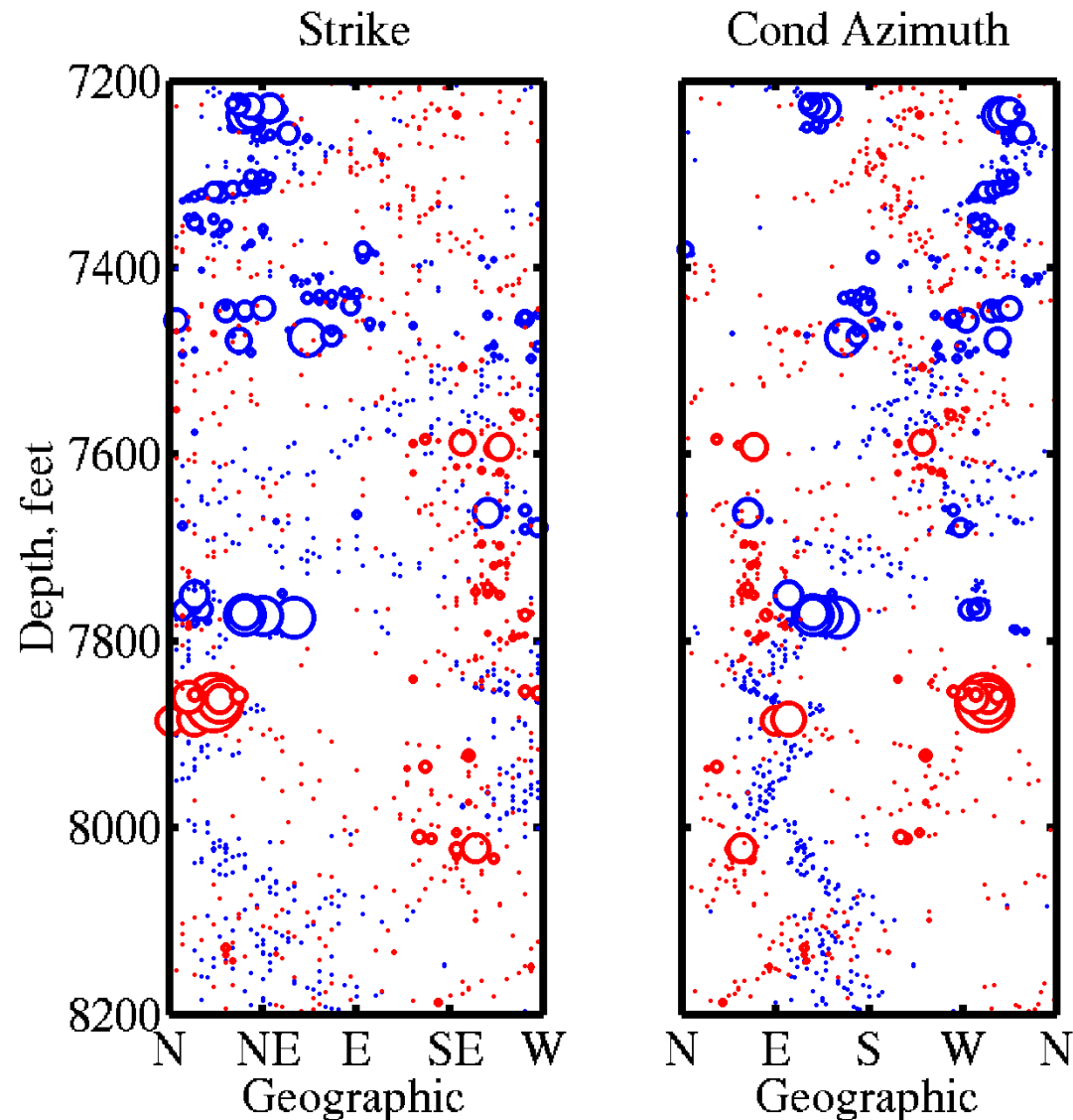


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Apparent strike and conductor azimuth: 66-21



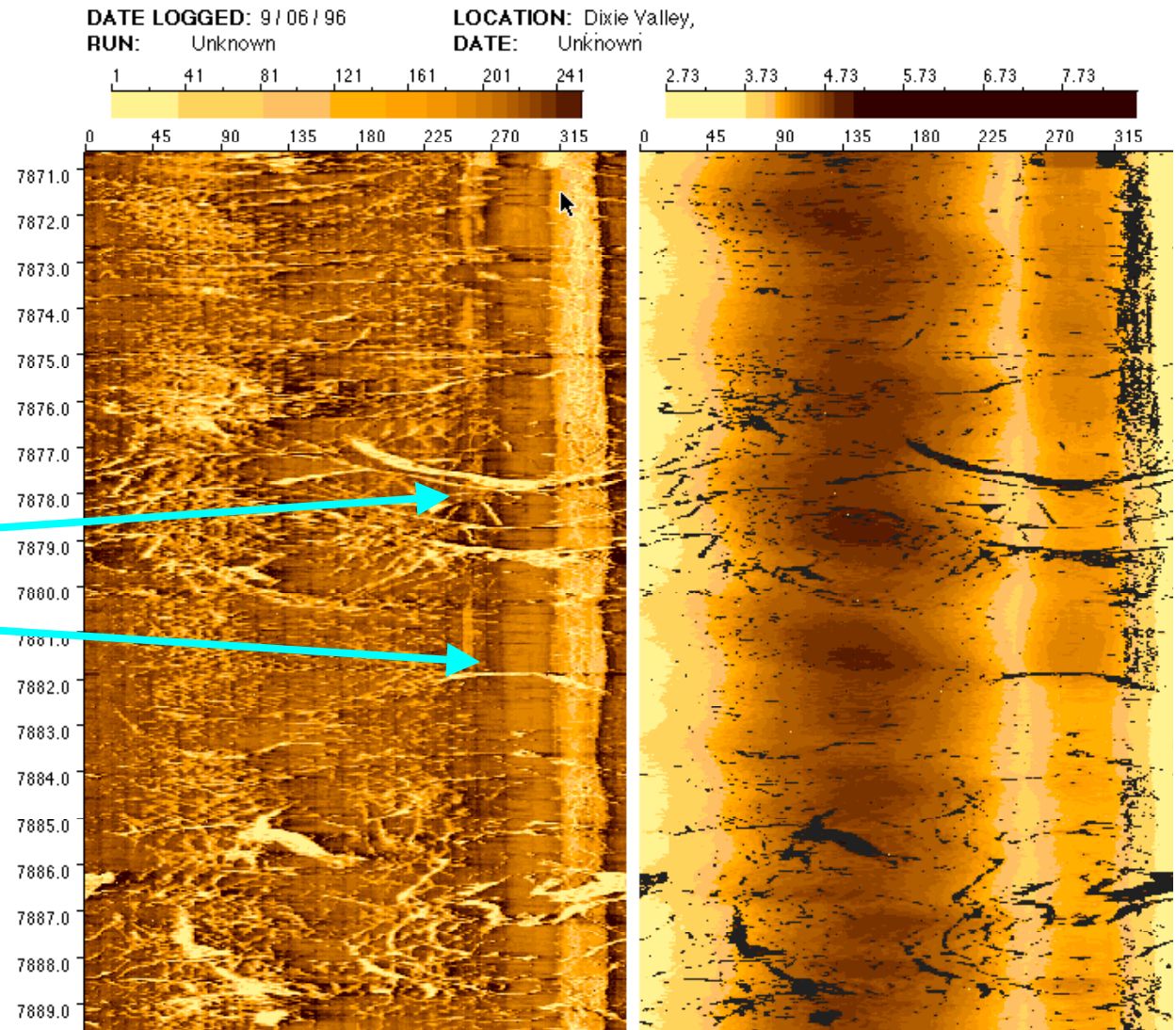
- Red determined from imaginary, blue from real.
- Circle size proportional to confidence
- Two strike azimuths are seen on log
- Conductor at 7880 ft. strikes 20 degrees and dips towards 110 degrees
- Two strike trends are seen in data
- What are we seeing?





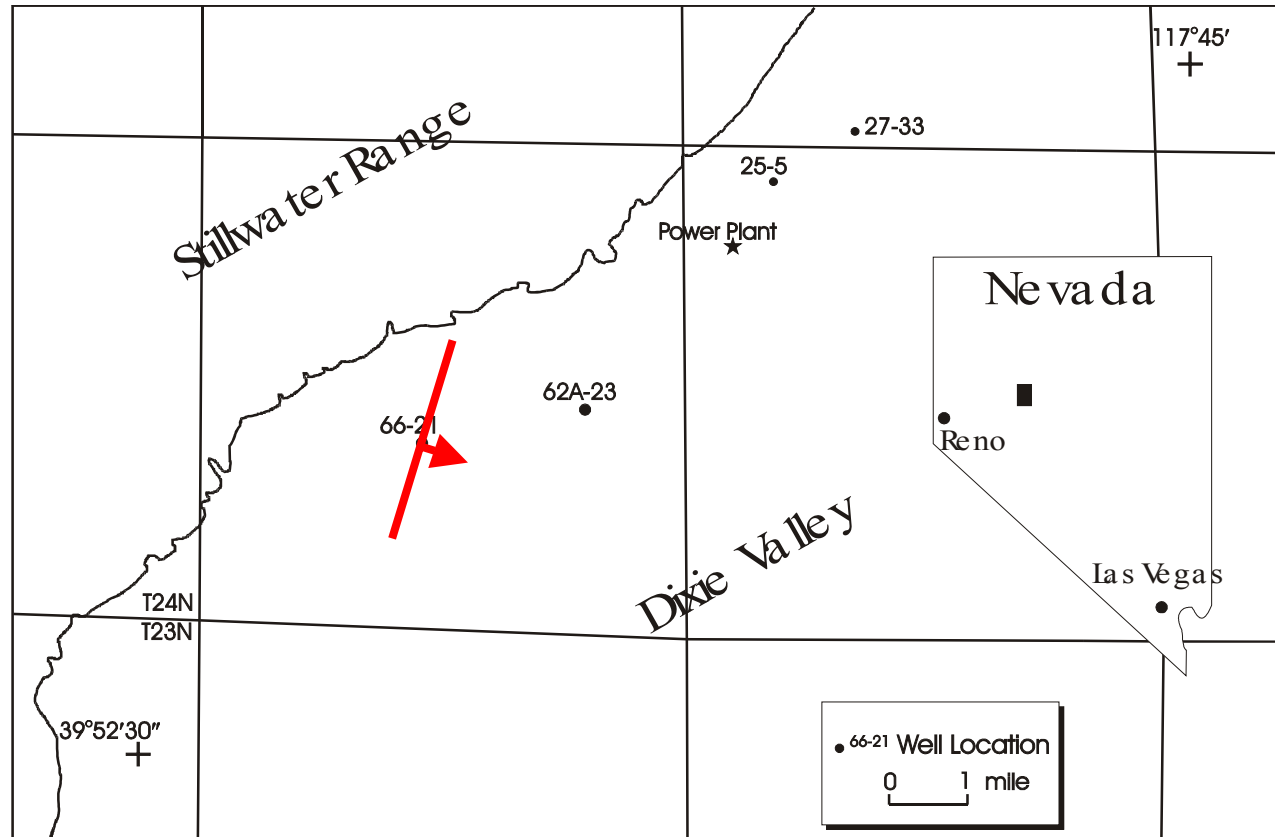
Borehole televiewer shows fractures

- This image is just below the 7880 ft. anomaly
- Complementary sets of fractures
- Dip azimuths
 - ~285
 - ~90
- Data from Steve Hickman





In 66-21 a thin conductor at 7880' dips ESE



GeoBilt reveals similar strikes for other features in the interval 7200' to 8200'.